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MONDAY, JANUARY 24, 1859.

JAMES HENTHORN TODD, D.D., President, in the Chair.

THE REV. J. H. JELLETT read a paper—

ON THE REFLEXION AND REFRACTION OF POLARIZED LIGHT.

THE object which the author has in view in this communication is to ascertain how far the theory of light which had been proposed by M. Cauchy can be considered to have been experimentally established by the observations of M. Jamin. For this purpose it is necessary to ascertain—

1. Whether the values of any of the quantities by which a ray of light is defined, as deduced from theory, differ from those given by experiment, by an amount greater than the necessary error of observation.

2. What variation the theoretic expressions admit of, preserving the necessary amount of agreement with observation.

In examining this question, he drew attention to the remarkable fact first noticed by Mr. Haughton, namely, that the expressions given by Cauchy and a modified form of those given by Green, although these expressions are essentially different, agree, so far as the case of reflexion is concerned, equally well with the experimental results of M. Jamin. This agreement between the expressions he accounted for by showing that the four equations of which each system consists may be reduced to the following form :—

*One* equation containing a constant depending upon the nature of the substance, and distinct from its index of refraction.

*Three* equations which do not contain any experimental constant.

Of this system of equations, the first alone is different in the two systems, the remaining three being the same in both. He showed from this, that by a proper determination of the experimental constant, a tolerable agreement between these equations may be insured.

He then proceeded to compare the values of the amplitude and phase of the reflected ray, as deduced by M. Jamin from theory and observation respectively, and showed that for certain values of the angle of incidence, the differences were too great to be ascribed to errors of observation.

Examining then the value given by M. Cauchy for the amplitude of the reflected ray, he showed that this expression would admit of very great variation, without ceasing to represent with sufficient exactness the results of observation.

On the whole, assuming the experiments of M. Jamin to have been accurately made, he concluded that these expressions did not represent the facts with sufficient accuracy; and further, that with regard, at least, to the value of the amplitude, the nature of the expression is such as to render an experimental proof of its truth very difficult.

The substance to which these statements refer is the transparent sulphuret of arsenic; this substance is selected because the experimental results of Jamin, and the values given by Fresnel, differ more widely for this substance than for any other. It furnishes, therefore, the best test of any new theory.

Mr. Jellett stated that he had obtained for the new constant, which M. Jamin calls "coefficient of ellipticity," a value sensibly different from that given by M. Jamin. The value of this constant given by M. Jamin for sulphuret of arsenic is

0.0791,

while that obtained by Mr. Jellett is

0.0914.

The Rev. Samuel Haughton made some remarks on Mr. Jellett's paper.

LORD TALBOT DE MALAHIDE, on the part of T. A. WISE, M. D., presented a cast of a stone cross which had been discovered in Perthshire.

Dr. Wise in the accompanying paper describes this sepulchral cross, recently discovered, and similar in character to a numerous class of crosses well known to Scotch antiquaries.

They are well described and portrayed in two fine works, "The Ancient Sculptured Monuments of Angus," by the late Mr. Chalmers of Auldbar, and "The Sculptured Stones of Scotland," published by the Spalding Club, through Mr. John Stuart, the able Secretary of the Antiquaries of Scotland.

These crosses are, with few exceptions, confined to the part of Scotland north of the Forth, but range through the eastern counties as far as Caithness, and even to Shetland. They are most numerous in the districts formerly occupied by the kingdom of the Picts.

With considerable resemblances to the Irish crosses, they differ in many important respects. They contain, frequently, hunting scenes and very strange animals, such as bears, lions, elephants, centaurs, &c. There are numerous emblems, such as the mirror and spectacle ornament described by Dr. Wise, and also many others which are hitherto unexplained. As a general rule, they have no inscriptions. Almost the only exceptions are the stone at Newton, on the Garioch, which has a Runic or Ogham inscription, and also another in an unknown character; there is also an inscribed stone at Brechin, and there is a stone at Bressay, in Shetland, with an inscription in Runes. A cast of this was exhibited at the Newcastle Meeting of the Archæological Institute; and it is very much to be desired that Professor Graves, who has done so much in this field of research, would give his interpretation of it.

There is another kind of crosses which are not included in those publications, found at Iona, and other parts of the west of Scotland. They are of a Scandinavian character.